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ABSTRACT

The effect of microcomputer word processing on college students' writing was investigated with three sections of a required freshman English course at Indiana University of Pennsylvania. Half of the subjects were randomly selected to use the university microcomputer in a laboratory setting to write eight essays, while the other half worked in their usual handwritten or typewritten modes. Measures focused on dimensions of attitude (pre- and post-anxiety, pre- and post-readiness, and reaction); performance (organization, idea development, grammar usage, sentence structure, and grade); process (brainstorming, outlining, rough drafting, and working on revisions); and computer resource costs. Final grade and sex were also recorded. Changes in measures were not consistent across the three sections. Results indicated that the overall effect of word processing on writing varies with the writer and with general factors related to the teacher and the class. Although the data do not support any general statements about the effect of word processing on writing, word processing use will be continued because it fits well with the current emphasis on process in writing, students like it, no major failures occurred, and positive changes in writing behavior were observed. Three references are listed. (Author/LMM)

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THE EFFECT OF WORD PROCESSING ON WRITING

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ABSTRACT : An empirical study investigated the effect of microcomputer word processing on writing in three sections of required freshman composition. Half of the students in each section were randomly selected to use the university microcomputer laboratory to write their essays, while the other half worked in their usual handwritten or typewritten modes. Measurements focused on attitude, nine (9) dimensions of performance and eleven (11) dimensions of process, as well as on computer resource costs.

1. INTRODUCTION

The advent of computer technology into the area of information generation, storage and retrieval has, as we all know, revolutionized the way we process information. Further, in spite of some philosophical reservation regarding computer managed information data systems, there has come to be a general cultural acceptance of the technology.

There has been some application of computer technology in the humanities, but there has not been the same widespread recognition of the value of the computer as there has been in math and science, for instance. Some critics would, in fact, define the lack of computer application in the humanities and in the field of English language instruction, in particular, as proof of the man vs. machine myth. And they may be right.

On the other hand, growing numbers of journal articles and notices of conferences devoted to computer technology indicate that teachers of writing are incorporating the computer into their classrooms, however gingerly, and that they are reporting on the effects to their colleagues. Furthermore, it is significant to note that the introduction of computer technology into writing instruction comes at a time when there is a revolution taking place in writing research and instruction. At the present time there is emphasis on gathering empirical evidence to determine what factors promote good writing, and there is growing concern with the process of writing. Thus, the climate is perhaps an ideal one for the empiric examination of the effect the computer has on the writing process.

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2. EXPERIMENT DESIGN

The intent of this experiment was to determine whether or not students' use of word processing had any measurable effect on their writing. The complexities of the writing process and the measurement of writing performance were dealt with by recording numeric data for almost 200 variables. Table 1 lists the specific items measured.

* Table 1. Experimental Measures *

Attitude	Performance	Process
Pre-anxiety	Organization	Number of Revisions
Post-anxiety	Development of Ideas	Total Time
Pre-readiness	Thesis	Perceived Effort
Post-readiness	Paragraph Coherence	Brainstorming
Reaction	Spelling	Outlining
	Grammar	Rough Drafting
	Usage	Revision 1 thru 6
	Sentence Structure	
	Focus	
	Grade	

The attitude measures were a composite of student responses on 18 questions taken from an anxiety measuring instrument developed by John Daly (Daly, 1979). The readiness and reaction measures consisted of student responses to twelve questions which were composed for this experiment.

The first essay was used as a benchmark to establish that the experimental and control groups started with comparable abilities. Seven essays and a final three-hour in-class final essay normally comprise the formal writing part of the course. Performance and process data were recorded for each applicable essay in each section. The basic form of statistical analyis was comparison of group means by analysis of variance using SPSS software.

The process measures of brainstorming, outlining, rough drafting and working on each revision were measured both for workahead and total time. A revision was defined as a major reworking of a particular essay. Final grade and sex were also recorded.

A pilot study helped to refine the measures and data gathering procedures. The principal change which was implemented as a result of the pilot study was to switch to

simpler word processing software. The original program, Screenwriter // (Sierra On-Line), had interesting capabilities and displayed a fair amount of text, but its moderately complex interaction mode and technologically interesting features interfered in the writing process. Bank Street Writer (Broderbund Software) was used in the actual experiment because it combines simplicity with adequate features for the writing that is done in this situation. Use of a simple word processing program minimized intervention of the technhnology into the writing process.

Course instructors assigned all performance measures. Grades were based on a system that uses letters with pluses and minuses in a way that translates to a numeric score from 0(F) to 19(A). All other performance measures were assigned as an integer from 0 to 4. Workahead measures and time spent on each part of each task were recorded by the students and discussed with the instructors. Perceived effort was determined by a simple question: "Circle the number which best described the amount of effort you expended on this essay in terms of the effort you generally exert in writing an essay:", with 1 labelled much less, 3 about the same, and 5 much more. Time actually spent in the microlab was transcribed from the lab assistant's log sheet.

The original design included additional essay readers to give second opinions on the performance measures. The difficulty of obtaining objective performance measures for writing tasks and the possible bias introduced by the more attractive word processed essays are two factors which we were concerned about. A second opinion on performance was not obtained simply because the request was not funded.

Because of the students' positive reception of the proposed experiment and their eagerness to use the technology, we were cconcerned that the control groups might be resentful of the special privileges given to the word processing groups. We addressed this problem by promising to give word processing training and laboratory privileges to the control group during the following semester. This promise was intended as a reward for the control group.

Extreme differences are normal for different groups of English 101 with abilities ranging from the marginally literate to groups which write at fairly high levels. We responded to this problem by establishing three different sections, with three different instructors, as the experimental group. A randomization procedure was employed to separate each section into a control and an experimental group. An attitude assessment instrument and the first essay

were planned as a check on the initial similarity of the groups.

We attempted to avoid the common problem of creating experimental differences which would result from giving the treatment group more instruction or writing time. No special help was given, and computer training sessions were held during class time.

A lack of basic keyboarding skills can get in the way of using word processing. Therefore, we introduced the students to using microcomputers by first having them load and interact with a typing tutorial.

Considerably more software options exist, such as spelling and style checkers (c.f. Wresch, 1983). Since the goal of this experiment was to isolate the effect of word processing, the investigation of the effects of these additional computer writing aids was left to other experimentation.

3. EXPERIMENT RESULTS

Table 2 displays the number of subjects in each group by section and sex. The three sections were different, both from the viewpoint of significant statistical differences and informal observations. Within each section, the control and word processing groups received similar scores on the preanxiety questionnaires and the first essay. Thus, the results for each section are treated separately, and observed differences within a section are attributed to the experiment. Moreover, it was observed very quickly that section 1 had the poorest writers, section 2 students had the poorest work habits, and section 3 had the best writers.

Table 2. Female/Male and Group Frequencies

Section / Group	1	2	3	Total
Treatment	8/3	6/4	7/3	21/10
Control	5/3	3/4	8/4	16/11
Total	13/6	9/8	15/7	37/21

The pretest anxiety measure showed generally negative correlations with performance and process measures

(one-tailed p≤.10 for m of n applicable measures). Change in anxiety scores were not ready at the time this paper was prepared.

Performance measures for the section 1 word processing group were consistently better than for their control group, but there were no significant differences. The word processing group in section 2 actually did marginally poorer work than their control group, with the biggest negative differences in spelling, development of ideas and thesis. In section 3 there was little difference except on essay 5, where the control group did better. In only three cases were any of these differences computed to be statistically significant (p≤.10).

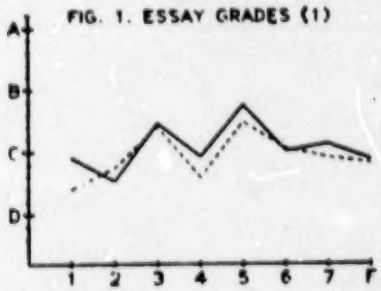


FIG. 1. ESSAY GRADES (1)

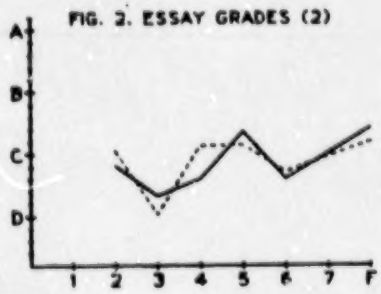


FIG. 2. ESSAY GRADES (2)

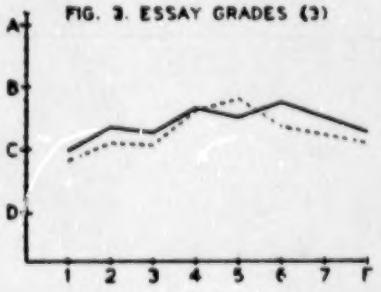


FIG. 3. ESSAY GRADES (3)

Working ahead improved the performance measures of the word processing group in section 3 far more than it did the control group (p≤.05 in m of n data pairings). Figures 1 thru 3 illustrate the average essay grades assigned, with tic marks at the points where numeric grades were actually recorded. (In all of the charts, the word processing group is drawn with a solid line and the control group with a broken line.)

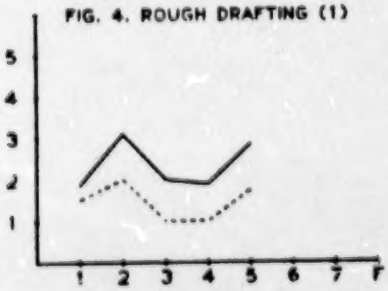


FIG. 4. ROUGH DRAFTING (1)

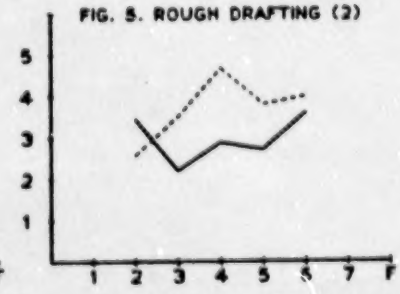


FIG. 5. ROUGH DRAFTING (2)

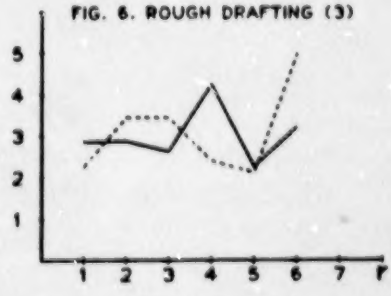


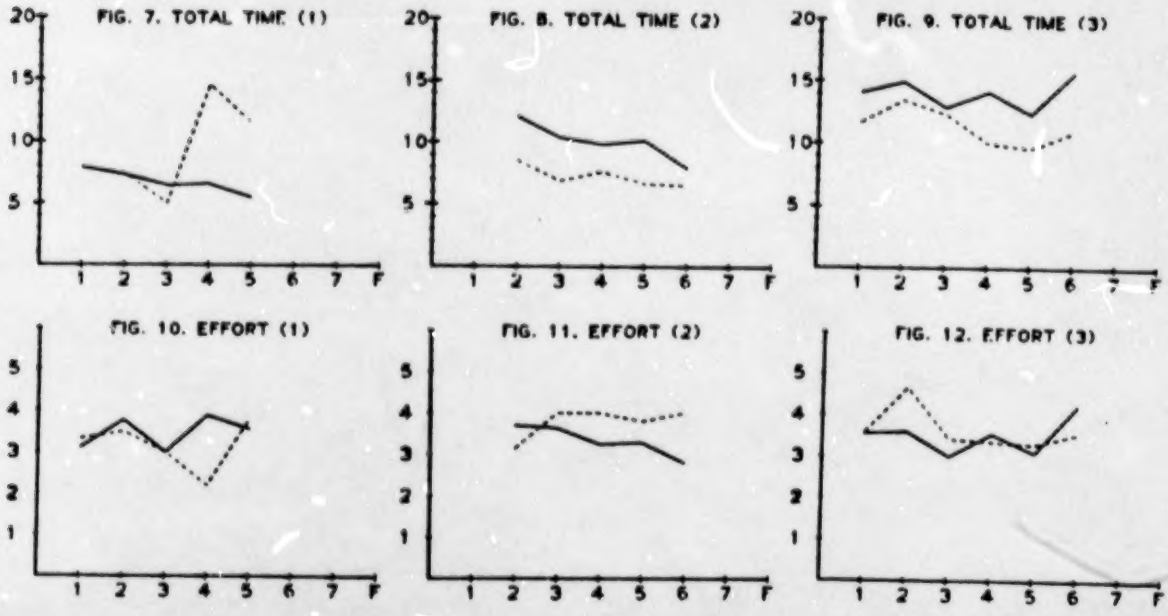
FIG. 6. ROUGH DRAFTING (3)

Figures 4 to 6 illustrate some of the workahead data. The y-coordinate represents days prior to the due date, with weekends and holidays not counted.

Workahead differences varied across the three sections. Section 1 workahead was greater for the word processing group, especially on essay 3 ($p < .05$ for 3 of the 5 measures). In section 2, essay 1 was not recorded, essay 2 workahead was better for the word processing group, essays 3 thru 6 were poorer and essay 7 data were very close. These observations were similar for all five measures, and the F-scores for these observed differences generally had probabilities in the range of .20 to .10. Section 3 exhibited fluctuations in the relative performance of the groups until essay 6, when the word processing group showed significantly greater ($p < .09$) workahead in all 5 measures. Section 3 also showed consistently more workahead than the other sections.

In sections 2 and 3, the word processing groups consistently spent more time. However, the word processing group in section 1 spent dramatically less time on the last three essays. These differences were only significant ($p < .10$) at two of the points of greatest difference. The total time data for each essay are displayed in Figures 7 through 9.

The perceived effort ratings showed that the word processing groups did not perceive their effort on each essay in the same relative scale as the control group. The perception of effort was likely to be much higher or lower than the actual expenditure of effort. These data are displayed in Figures 10 thru 12. There were statistically significant ($p < .05$) differences in each section.



Differences in the number of revisions were only observed in section 3, where the word processing group did more revising. The amount of lab time used in support of this project was estimated to be four (4) hours per student per essay. Actual laboratory costs and student laboratory behavior appear to be fruitful areas for further inquiry.

4. STUDENT WRITING CONSIDERATIONS

Indiana University of Pennsylvania is a state-supported institution with a heavy emphasis on undergraduate education and high admission standards (average combined SAT scores of 1008 in 1983). English 101 is required of virtually all undergraduates. These factors combine to produce the heterogeneous mix of pedagogical concerns which we addressed in our experiment. We took advantage of the fact that variation within sections tends to be much less than variation between sections.

The eight (8) writing samples which are produced in this class cover a variety of rhetorical modes, such as definition, description, process analysis, persuasion, classification, illustration and comparison and contrast. Although each instructor teaches these different rhetorical modes, there are, of course, expected variations in the way instructors approach composition instruction. Thus, trend analysis and repeated measure statistical techniques are only partially meaningful.

The greatest single physical concern in this experiment was the limitation placed by the microcomputer on student work habits. The lab was closed from 3 PM Friday to 8 AM Monday and from 10 PM to 8 AM during the week. This factor, combined with the need for the students to work on campus, caused some otherwise enthusiastic students to balk at empnasizing the use of computer technology in their writing. The results of this experiment might be different if students could work on truly personal computers, as is happening on some campuses. However, some students adapted to the lab environment and became the kind of enthusiastic users that we so frequently hear about in the current technological state of our society.

5. INTERPRETATION OF RESULTS

Changes in measures were not consistent across the three sections. The data show that the effect of word processing on writing varies with the writer and overall factors related to the teacher and class.

The failure of a number of marked differences in group means to be statistically significant was due to variation in the individual measures within the word processing groups. Our response to this will be to work on smoothing out problems of access to this technology and easing the constraints that it placed on our word processing subjects. At this point we are encouraged by a combination of the lack of any harmful effects, a goodly number of very positive individual experiences and the intrinsically promising nature of word processing in writing. However, we are also very cautious about accepting any broad generalizations about the effect of word processing on writing.

An unexpected result was that the pilot study data were good enough to give us insight into the practicality of teaching and using word processing in the drastically shortened six-week summer session. In fact, the more intense nature of the shortened session may have facilitated the adoption of a microcomputer lab writing mode. Students readily adapted to working in the laboratory outside normal class hours, and they appeared to work with a consistent and clear focus to a greater extent than what we observed during the regular Fall term. Thus, we are encouraged to make greater use of the microcomputer laboratory in shortened sessions.

6. CURRENT PROSPECTS FOR WORD PROCESSING IN THE WRITING PROCESS

The use of computer technology to teach writing offers opportunities to implement methodologies which may be helpful to the student. The writing laboratory, for example, is an ideal situation for students to exchange ideas about their writing and to engage in peer review. In every group of students there will be those who are more adept at mastering the technology than others, so a situation already exists where students share information. To encourage them to share their ideas, attitudes and criticisms about their writing is a natural outgrowth of a situation where they have helped each other with the technology they are using.

Augmenting sessions in the computer laboratory with

classroom demonstration of the word processor using a large screen monitor would provide students with extended opportunity to see how the fluidity of the composing process can be complemented by computer technology as well as to understand that the technology is a means to an end and not the focus of the activity.

Given the present state of empirical inquiry into both the writing process and the impact of the word processor in the writing process, the present study, while providing some evidence that computer technology affects the writing process positively, helps to define directions and conditions for further research.

It is clear that before significant claims for word processing in composition instruction can be legitimized, a great deal of research needs to be conducted with isolated variables. It is, for instance, important to define the variables associated with invention and revision. Before expending large sums of money to equip writing laboratories, it is important to determine to what degree fascination with novel technology accounts for the generally enthusiastic response of students to word processing. Intelligent management of resources and isolation of the elements which promote positive student attitudes toward writing mandate serious and immediate research.

7. SUMMARY

Isolated differences within sections were noted, but the experimental data did not support any general statements about the effect of word processing on writing. Efforts to use word processing will be continued because it is a promising concept that fits very well with the current emphasis on process in writing, people like it, no major failures have occurred and some very positive changes in writing behavior have been observed. However, we still cannot make a general statement about the effect of word processing on writing (possibly there is no uniform effect). It also appears that the impact of word processing on the amount of time spent on an essay writing task depends on a variety of factors beyond the basic technology.

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